Spring 2021

ME 305-004: Introduction to System Dynamics

Yazan Manna

ME 305 / Introduction to System Dynamics

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Course Description: Principles of dynamic system modeling and response with emphasis on mechanical, electrical, and fluid systems. Application of computer techniques. **Prerequisites:** Math 222, Mech 236, ME 231.

Course Objectives: Students are expected to:

1. Develop models of mechanical, electrical/electromechanical and fluid systems.
2. Analyze dynamic systems through the application of the Laplace transforms, block diagrams, and transfer functions.
3. Determine transient and steady state response of dynamic systems.
4. Calculate frequency response and use the results for vibration isolation.
5. Perform basic calculation related to automatic controllers and system response specification.
6. Use MATLAB in analyzing dynamics systems and control systems.

Required Text: K. Ogata, SYSTEM DYNAMICS, 4th Ed. 2004, ISBN: 0-13-142462-9, Prentice-Hall
Required Software: MATLAB

Grading Policy: Grades will be determined by performance on assignments and exams in terms of total points. The homework assignments (due in one week) will be worth 20% of total points. Two midterms will each be worth 50 % of total points. The final exam will be worth 30% of total points.

Make-Up Exams: If you have a serious reason for missing an exam, you must notify me BEFORE the scheduled exam period for prior approval. You are then responsible for arranging with me to make up the test within three days.

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf .

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

COURSE OUTLINE:

Week	Topic	Reading Assignment
1	Complex Algebra, Differential Equations, Laplace Transforms	Ch. 1, Ch. 2
2	Modeling of Mechanical Systems	Ch. 3.1-3.3
3	Mechanical Systems: Energy Method	Ch. 3.4
4	Transfer Functions, Block Diagrams	Ch. 4
5	Midterm, Transient Response	Ch. 4
6	Electromechanical Systems	Ch. 6.1-6.3, 6.5
7	Fluid Systems and Thermal Systems	Ch. 7.1-7.3, 7.6
8	Transient Response Analysis	Ch. 8.1-3
9	Frequency Response	Ch. 9.1-4
10	Vibration Isolation	Ch. 9.4-5
11	Midterm, Vibration Isolation (contd.)	
12	Control Systems, Automatic Controllers	Ch. 10.1-3
13	Control Systems, Response Specification	Ch. 10.4-5
14	Review	
15	Final Exam	